

Wisconsin Space Grant Consortium  
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## **PROGRAM DESCRIPTION**

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Wisconsin Space Grant Consortium is a Designated Consortium funded at a level of \$575,000 for fiscal year 2012.

## **PROGRAM GOALS**

### **Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals (Educate and Engage)**

Minor differences between these goals and objectives and those from the original proposal are due to changes being made each year as we incorporate lessons learned. These changes are noted in italics.

**Goal 1.** Enhance Wisconsin growth in aerospace while supporting the NASA workforce pipeline by (1) supporting workforce development initiatives and (2) testing methods of recruiting students early in their career and retaining top students throughout their schooling.

#### **Objectives**

1.1 Use our primary Workforce Development initiative, the Student Satellite Program, to broaden workforce opportunities for science majors, *especially at smaller four-year and two-year schools*, by supporting curriculum development and hands-on research in high-altitude ballooning activities.

1.2 Maintain our ability to recruit students from a wide range of Affiliate Member institutions by supporting and refining our Balloon and Rocket Programs.

1.3 Continue to budget specific money in the Other Student Awards Program to help support at least two students (more if selected) to NASA Academy, at least two students (more if applicable) to NASA Internships and at least one team involved in NASA's Reduced Gravity Program.

1.4 Increase retention of our best and brightest aerospace students by increasing Fellowship awards for our most highly-ranked graduate students (the top 10%) from \$5000 to \$8,000 and investigating raising the ceiling on our Undergraduate awards. (*This was a objective primarily introduced when augmentation funding became available and is not applicable to this report*)

1.5 Provide opportunities for our funded students, faculty and other experts to present their research at our twenty-second annual Wisconsin Space Conference, to be hosted by the University of Wisconsin-Whitewater.

1.6 Support and strengthen the national Space Grant program through the Director's elected leadership roles in the national organization.

1.7 Continue to press our Affiliate Members to build relationships with the Minority Advancement offices at their campuses, and nurture growing relationships.

1.8 Support the aerospace programs associated with our minority-serving institution, the College of Menominee Nation (CMN), by investing in *First Nations rocket launch activities*. (Note that this new wording includes but broadens the original goal of supporting a Tribal College Rocket Consortium)

1.9 Continue to recruit Affiliate Members to diversify our reach.

**Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty (Educate and Engage)**

**Goal 2.** Utilize the limited resources of the Consortium and the success of the current Special Initiatives Program to create a new suite of cohesive, progressive programs that recruit and better retain minority and female students from middle school through high school to our current higher education offerings.

**Objectives**

2.1. Partner with the College of Menominee Nation (CMN) in supporting aerospace-centered research and student activities under a special funding initiative that targets Native American students served by CMN.

2.2 Create a High School Rockets program as a partnership with SLI and Rockets 4 Schools, one that injects standards-based STEM curriculum into the already-successful Rockets 4 Schools spring rocket launch and closes the pipeline gap between students served by Rockets 4 Schools and those served by our University Rocket Competition.

2.3. Continue to nurture our strong relationships with our two minority-serving Affiliate Members, the College of Menominee Nation and Alverno College (a women's college with a large African-American student population).

**Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission (Engage and Inspire)**

**Goal 3.** Seek out more effective ways to encourage Wisconsin precollege educators to learn and utilize space-related content in the classroom, and find new, innovative methods of funding those efforts.

**Objectives**

3.1 Continue the current Aerospace Outreach Program, with increased emphasis on reaching out to educators directly.

3.2 Create new and expand existing High School-related programs (High School Rockets Competition; High School Partners) to (1) close the gap in our pipeline between K-12 and Higher Education students, and (2) provide direct support to NASA's 2011 Education Priorities.

### **PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, & 3)**

#### **Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals (Educate and Engage)**

- Based on a strong state need for more students choosing to enter NASA-related fields, our primary goal at the WSGC is *recruitment* of students into these fields. Once in, we have an extremely high *retention* rate. One example of the success of this method is Kristi Pajunen of the Milwaukee School of Engineering, who entered our Collegiate Rocket Competition in 2011-2012 and secured a NASA Internship at NASA/Glenn the following year. She states: "Both programs that I have done with the Space Grant have seriously directed my career path. Starting with the Rocket Competition, I became extremely interested and involved in aerospace related courses and activities. This interest got me the NASA internship that I had last summer. The experience I gained from that and the experience I am sure I will gain from future aerospace activities/internships will help me to get into graduate school to study aerospace engineering. These programs have also made me very satisfied with my life as a student, since I am so interested in what I am doing."
- Rocket activities for Native American students: This program comprises opportunities at a range of skills levels for native students to build and launch rockets in a collegial, culturally-relevant environment. Because of its nationwide reach, it necessarily draws from several funding sources, including the WSGC Base Grant. We use WSGC Base Grant money primarily to fund our student mentors, to fund local native teams and to support our staff in administering this far-reaching program.
- We continue to see increased applications and proposals from students and faculty at a wide range of affiliate member schools. We believe this is a result of our policy to invest in small, focused types of experiences that can enrich an undergraduate's experience at crucial points in their education, keeping them engaged, rather than funding programs focused at a single school. This flexible, non-centralized approach allows diverse campuses to participate fully in our programs. Importantly, it also allows individual students, no matter how large or small, well- or poorly equipped their campus, to plug in to our programs from a distance and take advantage of them.

#### **Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty (Educate and Engage)**

- While each of our programs is a standalone program funding separate projects, through careful design of these programs we have created a full pipeline of opportunities that a student can take advantage of at any point or level of experience in her or his education from middle school through graduate school. We shepherd students through this pipeline through directed workshops and one-on-one student contact at common transition points.

A middle or high school student participating in Rockets 4 Schools is encouraged to participate in our Collegiate Rocket Competition. A freshman recruited through our Undergraduate Scholarship program and interested in Astronomy would be introduced to the Undergraduate Research program, NASA Academy/Internship opportunities, and our WIYN observatory consortium. A promising engineering student would be guided through our Collegiate Rocket Competition or Elijah High-Altitude Balloon project, and then on to greater challenges such as a Reduced Gravity team. In this way, we turn recruitment into retention and ultimately into a steady stream of high-caliber Wisconsinites entering the NASA and aerospace workforce.

**Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission (Engage and Inspire)**

- Our Aerospace Outreach Program specializes in partnerships, in which NASA-related curriculum is the inspiration for long-term STEM activities between schools and other institutions. An example from this past year is *Spaceflight Academy for CESA District #7*, a teacher workshop on the history, math, science, and technology of spaceflight. 48% of the teachers who registered were at the middle school level while the remaining 52% were high school instructors. Emphasis was placed on the NASA Science and Human Exploration and Operations Directorates. In addition, the National Research Council's Science Education Standards were addressed throughout the workshop.

## **PROGRAM ACCOMPLISHMENTS**

### **Outcome 1 associated goals and objectives**

#### **Goal 1**

Objective 1.1 accomplishments. In response to the 2012 NASA CAN, we began forming partnerships with several two-year colleges, including affiliates and non-affiliates, to create a high-altitude balloon pilot program. This project was to focus efforts on retaining first- and second-year students with an interest in majoring in science disciplines, especially those at Wisconsin tribal colleges and 2-year institutions. We planned to utilize WSGC and partner experience and resources to train students and faculty at partner schools to design, build, fly and analyze data from science payloads launched on high-altitude balloons. Though we were unable to build these new partnerships in the time available, the connections made through the effort were extremely encouraging and we continue to pursue this idea in the hope to be ready when another such opportunity arises.

Objective 1.2 accomplishments. We supported 72 students in 13 teams from 7 affiliates in the Collegiate Rocket Competition, an increase in representation from last year; 2 teams represented the first or second time a team was fielded from that institution. We also funded 10 students from 4 affiliates in the Elijah High-Altitude Balloon teams.

Objective 1.3 accomplishments. In FY12 with our base grant we funded 8 NASA Academy or Center interns and 2 NASA Reduced Gravity teams (14 students).

Objective 1.4 accomplishments. As in FY 11, we have chosen not to raise the ceiling on our Undergraduate Awards based on the limits of our current base grant.

Objective 1.5 accomplishments. The 22<sup>nd</sup> Annual Space Conference, hosted by UW-Whitewater, had 105 registered attendees from all over the state.

Objective 1.6 accomplishments. Director R. Aileen Yingst is currently serving as an active member of the Space Grant Directors' Executive Committee and Nominating Committee. This year, the Director and Program Manager each also led an ad hoc committee set up by the Space Grant Director.

Objective 1.7 accomplishments. Diversity plan compliance covers 80% of members.

Objective 1.8 accomplishments. We currently have 7 teams from 7 institutions nationwide participating in our First Nations Launch activities. This year we funded three students in this competition from the College of Menominee Nation out of base funds. Additional WSGC budgetary contributions to this objective includes funding for students and staff to provide non-technical support to the program.

Objective 1.9 accomplishments. Our current membership now stands at 41 institutions. We have gained at least 1-2 new members per year for the past five years. Our newest members are Concordia University (5/12), Crossroads at Big Creek (10/12), and UW-Stevens Point (11/12).

### ***Other Progress and Accomplishments under Outcome 1***

**WSGC Scholarships, Undergraduate Research Awards, and Fellowships:** In FY 12 we made awards to 37 students within these three programs using NASA base funding (there were 2 people that received a scholarship and research award). Of those awards, 10 went to Undergraduate Scholars, 11 to Undergraduate Researchers, and 18 to Graduate Fellows, including the winner of the Dr. Laurel Salton Clark Award. Member institutions are leveraging our support to at least three additional undergraduate students with internal funding. Students will present their findings at this summer's Wisconsin Space Conference to be held at Marquette University in August.

**Research Infrastructure Program:** Five Research Infrastructure grants were awarded to provide relatively new faculty or staff the opportunity to establish a space-related research project, or more experienced faculty or staff the opportunity to begin new space-related research programs. Also included here is support of the WIYN Astronomy Consortium, which provides 1-3 observing nights per year to faculty and students.

**Higher Education Incentive Grants:** Five awards were made to college or university faculty or academic staff interested in developing a new course, minor, major, or curricular area related to any NASA-related discipline.

**Industry Awards:** We have partnered with our Industry members to fund two research awards to Industry/Academic teams, to foster partnerships in research between academia and industry.

### **Outcome 2 associated goals and objectives**

#### **Goal 2**

Objective 2.1: We funded 3 Native American students through our Base Grant this year.

Objective 2.2: We used funds other than our Base Grant to fund our High School Rockets program.

Objective 2.3: We have discussed our native programs earlier.

### ***Other Progress and Accomplishments under Outcome 2***

**Special Initiatives program:** Seven awards were made to faculty, educators or other individuals or groups to develop and conduct innovative programs that target groups

traditionally underserved in aerospace. This program rarely funds higher education students directly, but often funds programs that have been proposed by undergraduate and graduate students.

### **Outcome 3 associated goals and objectives**

#### **Goal 3**

Objective 3.1: Our Aerospace Outreach Program is designed to fund innovative planning grants and supplemental grants for projects that increase interest, recruitment, experience and training of pre-college students in the pursuit of space- or aerospace-related science, design, or technology, or encourage K-12 students in space-related pursuits. We have funded 7 projects under this program.

Objective 3.2: To support these programs we have secured new personnel; this individual is not funded through the Base Grant.

## **PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES**

**Student Data and Longitudinal Tracking:** Total awards = 125, 3 students received awards in more than one project; Fellowship/Scholarship = 42; 4 of the fellowship/scholarship awards, or approximately 9%, are self-reported underrepresented minority funding. We currently cannot report on our Higher Education/Research Infrastructure programs, or the number of students taking the "next step" because tracking is not complete. But for FY11, of the 101 students moving on to the next step, 5 students have accepted STEM positions in an aerospace industry, while 10 have graduated and are pursuing advanced STEM degrees; 77 others are in STEM, non-aerospace positions.

**Minority-Serving Institution Collaborations:** Wisconsin has two tribal colleges and one primarily female college. Of these three institutions, two are members of the WSGC: Alverno College and the College of Menominee Nation (CMN). Both are active members. Paul Smith, a professor at Alverno College, is a key mentor in our Collegiate Rocket program. Our primary interaction with CMN is the First Nations Launch activities described above, which often includes hosting the associated workshops.

**NASA Education Priorities:** Our focus this year was on the NASA Education Priorities of authentic experiences, diversity, community colleges and research infrastructure.

- ***Authentic, hands-on student experiences:*** To meet this priority, nearly *every student* funded directly by the WSGC (except for some of our scholars where funds are meant to pay tuition) is required to be engaged in a active, authentic, hands-on, problem-solving experience. This includes all students funded through our Undergraduate Research and Graduate Fellowship programs; all NASA Academy, Intern and special programs students; all students funded by faculty under our Research Infrastructure program, and all of our Student Satellite Initiative team members and interns.

- ***Diversity:*** First Nations Launch activities reported here significantly supported increasing the diversity of institutions, faculty and student participants both in Wisconsin (among our native students) and nationally (through recruitment of tribal schools and student teams across the country). For FY 12, we supported 7 teams from 7 schools in

this endeavor, thereby encouraging native students from 5 states across the country in hands-on, authentic STEM-related and NASA-related activities.

- **Community Colleges:** The WSGC has four members that are two-year or technical colleges (15% of academic members). All WSGC members are equal members of the Consortium and have an equal representation on our Advisory Council. Additionally, we have begun discussions with UW-Colleges (the two-year college equivalent of our UW-System for four-year colleges) to determine if membership of the entire two-year college system is feasible and desirable.

- **Research Infrastructure:** In Wisconsin, one of our highest state priorities is recruitment of students and faculty in NASA-related research. We have, for this reason, steadily increased the amount available for Research Infrastructure grants to early career faculty to pursue NASA-related research.

### IMPROVEMENTS MADE IN THE PAST YEAR

- The major change in the WSGC this year was in personnel. Our office is managed by 2.5 individuals: a Program Manager (100%), an Office Manager (100%) and the Director (50%). In FY 12, our Program Manager of 15 years and our Office Manager of 10 years both retired and left our office. Thus, this FY was spent conducting personnel searches and training personnel on the job. This has been a highly successful process and we are extremely pleased with the results.

- FY 12 saw the first launch activities of the Regional Collegiate Rocket Competition. Twelve teams from five states throughout the Great Midwestern Region participated. Teams were tasked with designing a one-stage, high-powered rocket that, during its ascent, would transmit live video from a downward looking camera to a ground receiver. The rocket needed to reach an apogee of 3,000 feet and be recovered safely and in flyable condition. Weather proved to be the greatest challenge as the launch needed to be rescheduled to the next day due to low cloud cover. Feedback from the participants was very positive for this pilot project and another regional launch is scheduled for 2013.

### PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

#### Wisconsin Space Grant Consortium Members

Alverno College	Academic	4yr bac
Carroll University	Academic	4yr bac
Lawrence University	Academic	4yr bac
Ripon College	Academic	4yr bac
St Norbert College	Academic	4yr bac
University of Wisconsin-Oshkosh	Academic	4yr bac
University of Wisconsin-River Falls	Academic	4yr bac
Wisconsin Lutheran College	Academic	4yr bac
Carthage College	Academic	4yr bac/Grad
University of Wisconsin-Green Bay	Academic	4yr bac/Grad
University of Wisconsin-La Crosse	Academic	4yr bac/Grad
University of Wisconsin-Parkside	Academic	4yr bac/Grad
University of Wisconsin-Platteville	Academic	4yr bac/Grad

University of Wisconsin-Stevens Point	Academic	4yr bac/Grad
University of Wisconsin-Stout	Academic	4yr bac/Grad
University of Wisconsin-Superior	Academic	4yr bac/Grad
University of Wisconsin-Whitewater	Academic	4yr bac/Grad
Milwaukee School of Engineering	Academic	Bac/Master
College of the Menominee Nation	Academic	Tribal
University of Wisconsin-Fox Valley	Academic	Com/Jr
University of Wisconsin-Sheboygan	Academic	Com/Jr
Western Technical College	Academic	Com/Jr
Marquette University	Academic	PhD
University of Wisconsin-Madison	Academic	PhD
University of Wisconsin-Milwaukee	Academic	PhD
Medical College of Wisconsin	Academic	Medical
Aerogel Technologies, LLC	Industry	Aerospace
Astronautics Corporation of America	Industry	Aerospace
Orbital Technologies Corporation	Industry	Aerospace
Space Explorers, Inc.	Industry	K-12 Ed.
Space Education Initiatives	Industry	Informal Ed.
Spaceflight Fundamentals, LLC	Industry	Informal Ed.
Experimental Aircraft Association (EAA)	Not-for-Profit	Aviation Ed.
AIAA – Wisconsin Section	Not-for-Profit	Student Eng.
BioPharmaceutical Technology Center Institute	Not-for-Profit	Informal Ed.
Great Lakes Spaceport Education Fnd, Inc.	Not-for-Profit	K-12 Ed.
Spaceport Sheboygan	Not-for-profit	Space Ed.
Wisconsin Association of CESA Administrators	Not-for-Profit	Formal Ed.
Wisconsin Aerospace Authority	Government	State
Wisconsin Department of Public Instruction	Government	State
Wisconsin Department of Transportation	Government	State

All WSGC members have equal status and equal representation on our Advisory Board regardless of their size.

**The National Space Grant Office requires two annual reports, this Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.**